



# Collaborative backcasting for transport policy scenario building

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## ABSTRACT

Scenarios are often used to examine different futures where there is considerable uncertainty or where the business-as-usual is no longer appropriate. Backcasting is one form of scenario building where a normative view is taken about desirable futures, and the method then investigates different policy packages that can be used to reach those futures and the alternative pathways that can be followed. Where most difficulties have arisen in the past has been in bridging the conceptual elegance of the approach with the practicalities of implementation. Collaborative backcasting bridges this ‘implementation gap’ through a participatory approach in which different stakeholders take an active role in building scenarios, in identifying policy measures and packages, and in evaluating different pathways. Using the region of Andalusia (Spain), this paper brings together the different strands of this collaborative methodology where a set of alternative transport futures have been considered, together with the means to achieve a sustainable transport system for 2050. It discusses eight issues: (i) the selection of participants; (ii) the combination of participatory techniques; (iii) the development of learning processes; (iv) the need for and role of mediators; (v) the diversity of transport futures and integration of policy pathways; (vi) the timeline and future horizons; (vii) the acceptability of different pathways; and (viii) the legal and institutional constraints to effective implementation. Conclusions on the appropriateness of collaborative backcasting are drawn.

## 1. Introduction

Increasingly, policy-makers are being asked to think about the longer term futures for their cities and regions that embrace sustainable transport, but also have the flexibility to address uncertainty and potential unintended consequences (Lyons & Davidson, 2016; Seidl & van Aaken, 2009). Scenario analysis has helped to provide a set of approaches that meet these requirements, and backcasting is one particular form of scenario building (Heger & Boman, 2015; Kishita et al., 2017; Mendoza, Sharmina, Gallego-Schmid, Heyes, & Azapagic, 2017). Its aim is essentially to explore divergent and innovative policy trajectories to reach desirable transport futures when the business-as-usual (BAU) projection is no longer appropriate (Åkerman & Höjer, 2006; Hickman, Ashiru, & Banister, 2009; Neuvonen & Ache, 2017; Robertson, 2016). The backcasting approach fundamentally responds to the following question “how can a specific transport target be reached (e.g. CO<sub>2</sub> reduction, energy efficiency, etc.), when the prevailing structure (e.g. institutional frameworks, legal systems, etc.) blocks necessary changes?” (Börjeson, Höjer, Dreborg, Ekvall, & Finnveden, 2006 p.372). In the transport policy field, backcasting applications are mainly related to the development of new transport visions for strategic planning (Hickman, Ashiru, & Banister, 2011; Hickman & Banister, 2014; Tuominen, Tapio, Varho,

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Järvi, & Banister, 2014), the design of future technological roadmaps for the transport sector (Ashina, Fujino, Masui, Ehara, & Hibino, 2012; Markus & Jonsson, 2006; Olsson, Hjalmarsson, Wikström, & Larsson, 2015; Zimmermann, Darkow, & Heiko, 2013), and the achievement of CO<sub>2</sub> reduction goals by both passengers and freight transport (Mattila & Antikainen, 2011; Winyuchakrit et al., 2011).

The basic argument is that the BAU pathway is unsustainable and policy measures (combined as policy packages) cannot achieve the targets set for sustainable transport (e.g. for CO<sub>2</sub> reduction). Backcasting identifies desirable futures, and then looks at different pathways that can be followed to achieve the stated objectives – this is the backcasting process from the future to the present (Vergragt & Quist, 2011). Conventionally, there are three stages used (Fig. 1). The first is the “visioning phase”, that establishes a baseline showing the BAU projection, together with the construction of a series of images of future for desirable transport alternatives in the longer-term (25–30 years). The second stage, “policy packaging”, focuses on elaborating a set of policies and packages that might help in reaching the images of desirable futures, with detailed pathways and timelines for implementation. Finally, the third stage is “appraisal”, based on assessing the impact of policy pathways against environmental, social, and economic issues, as well as the feasibility, acceptability and potential barriers to the proposed pathways.

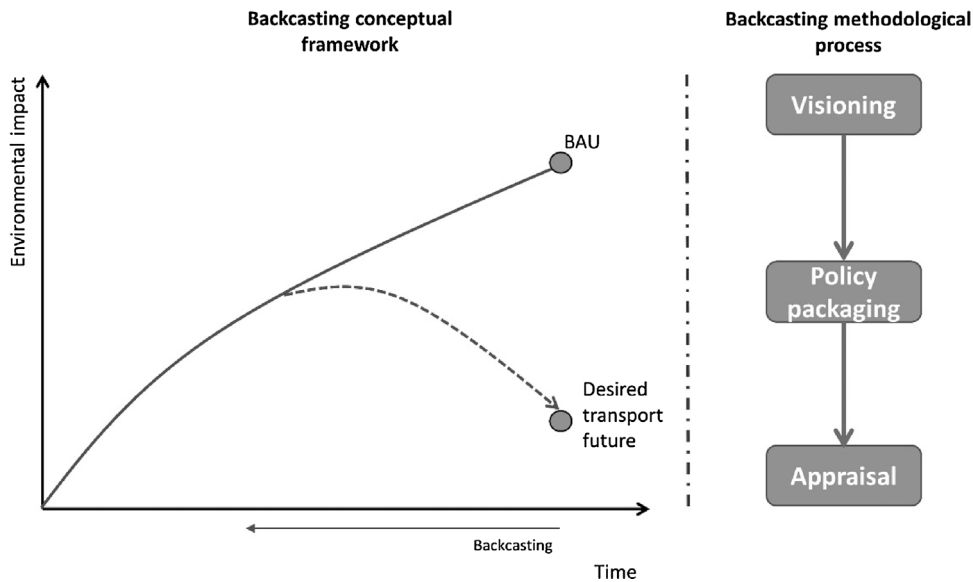


Fig. 1. The Backcasting Process (Inspired by Banister & Hickman, 2013).

In the field of transport policy, the backcasting process has been traditionally seen as an expert-led analysis, with little opportunity for stakeholder engagement apart from the workshops to discuss the options at each of the three stages (Fig. 1). This has generated a growing gap between academic backcasting studies and real transport practice – the implementation gap (Banister & Hickman, 2013). The main objective of the “BACK-SCENE project”<sup>1</sup> has been to further assess how the incorporation of participatory methods in transport backcasting scenarios can facilitate (or not) more effective links between research and policy action (Fig. 2). The context of Andalusia (Spain) was taken as spatial laboratory for experimentation, and this location has been held constant all three stages of the project (Fig. 1): (i) to generate visions for the Andalusia transport sector by 2050 using participatory techniques (Soria-Lara & Banister, 2017a); (ii) to construct participatory policy packages for reaching targets established in the transport future visions (Soria-Lara & Banister, 2017b); and (iii) to test with policy-makers the impact and implementability of transport scenarios, and to evaluate the different pathways (Soria-Lara & Banister, 2017c). Throughout this project, the primary concern has been over developing the collaborative backcasting methodology, and this has involved extensive and time consuming surveys, interviews, and face-to-face meetings to bridge the implementation gap between theory and practice. Around 100 participants, including the public, policy-makers, consultants from different professional domains, and academics have been actively involved in the different backcasting stages.

This paper presents the main results from each of the three stages of the BACK-SCENE project, and it reflects critically on the findings and lessons learned during the research. There is a particular focus on whether intensive involvement of stakeholders in fully participatory process results in a closer linkages between research and policy action – the bridging of the implementation gap. The findings are based on analysing and synthesising the views from both participants and researchers on the three stages in the scenario building process as implemented in Andalusia. In addition, comparisons have been made where relevant with the wider methodological literature. The participants’ views cover points that are mainly focused on methodological and technical issues. This sample of

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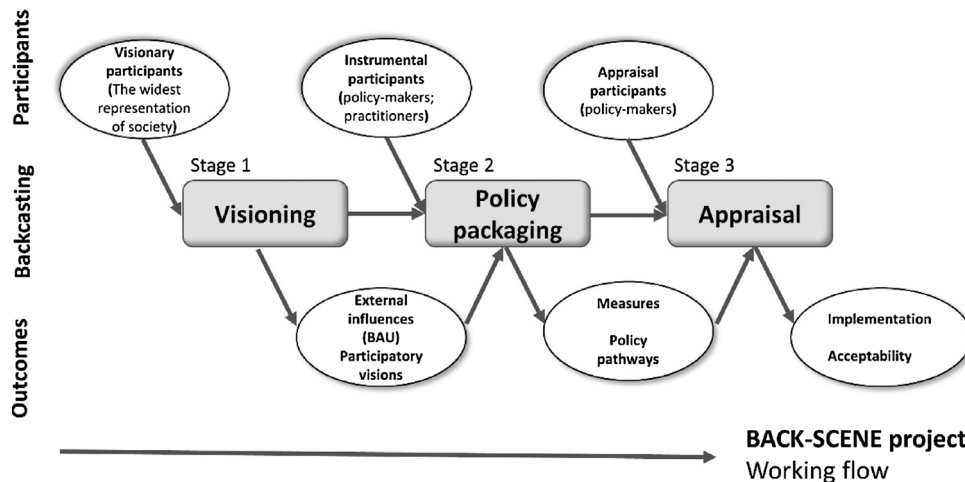


Fig. 2. The BACK-SCENE project structure and working flow.

participants consisted people who participated during all three stages of BACK-SCENE project, and their views were codified during several rounds to elaborate a narrative on lessons learned about collaborative backcasting. These views provide a consistent and realistic picture on whether and how results and methods used during collaborative backcasting are usable and exportable to Andalusia practice, and why. The views from the researchers contextualise these reflections from a wider perspective, facilitating comments on the capacity of the methods used to be adopted in other contexts, as well as the academic implications of the collaborative process carried out. The researchers' views were also collected during the implementation of each BACK-SCENE stage, and they also provided a comprehensive narrative at the end of the project.

Section 2 summarises the three main stages investigated in the collaborative backcasting framework implemented for Andalusian transport sector. Section 3 presents a discussion on the findings, looking constructively at the lessons learned, as well as the ways forward. Section 4 closes the paper with some further comments, reflections and concluding remarks.

## 2. A collaborative framework for backcasting scenarios in Andalusian transport

This section presents an overview of the collaborative framework that the BACK-SCENE project has implemented in Andalusia, covering the elements from the three backcasting stages: 'visioning', 'policy packaging', and 'appraisal' (Figs. 1 and 2).

### 2.1. Visioning stage

The region of Andalusia is located in the south of Spain and has 8,402,305 inhabitants. Andalusian authorities have a clear policy desire to implement a sustainable transport strategy for the region (2050). The primary target has been to reduce transport CO<sub>2</sub> emissions of 60% by 2050, compared with 1990 levels. However, the BAU projection does not create sufficient change for the region, and it fails to achieve the CO<sub>2</sub> reduction targets. The BAU means that tourism and the agricultural sectors will continue to dominate the Andalusia GDP, there will be a consolidation of a car-oriented society, there will be low penetration of information and communications technologies (ICT) and new transport technologies, an increase in distance to daily destinations, as well as difficulties in promoting high level of non-motorised mobility at the city level (Agencia Andaluza de la Energia, 2014; Soria-Lara, Valenzuela-Montes, & Pinho, 2015). This future is not sustainable.

To address this problem, alternative and desired transport futures for Andalusian were created for 2050, exploring the preferences and the concerns from the perspective of key stakeholders in Andalusian society. The participatory process involved a wide range of Andalusian interests, combining Delphi analysis (with two rounds of interactions) and semi-structured interviews. In contrast to the BAU-projection, the storylines identified for the desired Andalusian transport futures are based on: (i) fundamental changes in Andalusian economic model; (ii) decreasing coastal tourism, and reductions in both air and car traffic; (iii) priority for railway transport at the regional level; (iv) a higher implementation of low emission vehicles; (v) more liveable cities, including strong promotion of walking and cycling; (vi) increasing the number of multi-modal transport facilities. Soria-Lara and Banister (2017a, p.118–122) have presented the storyline as follows:

*"The desirable transport future relies on a fundamental change in the economic model of Andalusia. The agricultural model would be more orientated towards the production of high-quality ecological products focusing on local consumption, reducing the distance of freight travel and facilitating home delivery of goods. Meanwhile, the existing coastal tourism is expected to decrease and to become re-orientated as a sustainable tourist model based on cultural tourism (e.g. historic monuments, town centres, etc.). This means a reduction of both air and car traffic."*

*Collective and public transport systems would provide the main motorised transport modes in Andalusia by 2050, with the preferred mode being the railway transport system (even for freight transport). The use of private vehicles would be strongly reduced, fostering car sharing initiatives between citizens. The implementation of zero and low emissions vehicles would be strongly promoted in both private and public transport modes (principally electric and hybrid vehicles), including the introduction of electric bikes*

*There would be a preference for cities to be free of motorised vehicles, where the distances to daily destinations were shorter. In this sense, part of the existing car infrastructures would be used as socialization spaces for pedestrians, and for cycling and public transport infrastructures, including an increase in the number of intermodal facilities, as this would encourage a higher use of public transport modes”.*

## 2.2. Policy packaging stage

To reach the transport vision identified for 2050, three policy pathways have been formulated, following a dynamic participatory process based on a series of face-to-face workshops. Participants (practitioners from different professional domains and policy-makers) firstly clustered a long list of 53 individual policies into 10 policy packages, and the policy packages were then combined to be consistent with the following three policy pathways, including timelines for implementation (Table 1, and Soria Lara & Banister, 2017b):

- **Pathway 1: *lower carbon emissions*** consisted of the combination of five policy packages. The highest priority was given to *PP5 Multi-modality* and *PP10 Infrastructure investments*, while an intermediate priority was given to the following PPs: *PP7 Non-motorised modes*, *PP1 Low emission vehicles* and *PP4 Freight transport*.
- **Pathway 2: *technological innovation*** consisted of the combination of four policy packages. The highest priority was given to two PPs: *PP1 Low emission vehicles* and *PP2 ICT*. A second level of priority was given to *PP4 Freight transport* and *PP8 Traffic management*.
- **Pathway 3: *urban compactness*** consisted of the combination of four policy packages. The highest priority was given to four PPs: *PP5 Multi-modality*, *PP6 Liveable cities*, *PP7 Non-motorised modes* and *PP8 Traffic management*. An intermediate level of priority was given to *PP10 Infrastructure investments*.

**Table 1**

Description of policy packages (PPs).

Source: Soria-Lara and Banister (2017b, p.24)S.

| Policy Packages  |
|--|
| <p><b>PP1. Low Emission Vehicles.</b> It focuses largely on hybrid technologies and lean burn engines. It also pursues additional benefits if alternative fuels are used in conjunction with petrol and diesel hybrids and conventional internal combustion engines. There is a major role here for the motor industry and the regional government fostering the purchase of hybrid and electric vehicles.</p> |
| <p><b>PP2. ICT.</b> It explores the potential to modify travel patterns and reduce carbon emissions from ICT developments. These measures are mainly targeted at personal and freight travel.</p>  |
| <p><b>PP3. Pricing regime.</b> It has a double objective: (i) Reorienting car taxes towards more environmental friendly schemes; (ii) Making the public transport system cheaper. These measures are mainly targeted at personal travel.</p>   |
| <p><b>PP4. Freight transport.</b> There is a wide range of measures under this package from subsidiarity (fostering local production and reducing freight travel distance) to implementing hybrid and electric technologies for urban delivery.</p>  |
| <p><b>PP5. Multimodality.</b> It covers a set of individual measures focused mainly on increasing the interconnections between the different transport modes: private and public modes, individual and collective modes, motorised and non-motorised modes. Moreover, these measures aim at incrementing the transport network efficiency.</p>   |
| <p><b>PP6. Liveable cities.</b> This package focuses on using urban form and the planning system to support sustainable transport, with public transport oriented developments, green belts, as well as a new strategic planning model that facilitates the integration between land use and the transport system.</p>   |
| <p><b>PP7. Non-motorised modes.</b> It aims at promoting lower-emissions mobility and focused on pedestrianisation and the promotion of cycling infrastructures. This package is mainly targeted at personal travel.</p>   |
| <p><b>PP8. Traffic management.</b> This package covers three main purposes: (i) Ecological driving (e.g. decreasing speed limits); (ii) Smarter choices (e.g. implementing company transport plans); (iii) lower carbon mobility (e.g. limiting circulation to motorcycles). These measures are mainly targeted at personal and freight travel.</p>  |
| <p><b>PP9. Public awareness.</b> The aim of this package is to increase the awareness of citizens concerning major transport impacts. The set of measures integrated in this package cover from campaigns for car sharing and ecological driving habits to traveller information. This package is mainly targeted at personal travel.</p>  |
| <p><b>PP10. Infrastructure investments.</b> This package focuses on using infrastructure investments to support sustainable transport, with higher investments in rail infrastructures, high-occupancy vehicles lanes, etc. It is mainly targeted at personal and freight travel.</p>  |

### 2.3. Appraisal stage

To assess the effects of the three policy pathways implementation against environmental, social, and economic impacts, a collaborative framework was developed that combined multi-criteria analysis (MCA), together with face-to-face workshops (Soria-Lara & Banister, 2017c). Policy-makers from local and regional institutions took part in the process. Firstly, policy-makers determined potential sustainability impacts (environmental, social and economic) of the series of Andalusian transport future images, together with the respective policy pathways outlined in Sections 2.1 and 2.2. Secondly, MCA was used to rank the sustainability impacts produced by each policy pathway. Thirdly, the feasibility, acceptability, and potential barriers to each of the three policy pathways in the region of Andalusia were discussed.

The results demonstrated that positive environmental and economic impacts will be generated through the implementation of each of the three policy pathways, but the social impacts were less positive. In this respect, an integrated approach to transport policy-making was seen as being fundamental to the achievement of significant progress towards sustainable transport futures. This includes behavioural change incentives, alternative fuels, high levels of technological penetration, greater energy efficiency, and other policy interventions that all need to be introduced as part of a consistent set of mutually supporting policies. This includes the determination of the level of responsibility for different sectors (public institutions, private companies, citizens, etc.) in implementing such policy options, as well as identifying synergies and contradictions between policy alternatives. The case of Andalusia has shown how policy-makers have underlined the need to establish coordination panels between institutions, the private sector, and citizens as part of a successful transport-policy implementation process. In this way, a sustainable transport future can be realistically implemented over the period to 2050.

### 3. Lessons learned

Here, we present a set of issues and emerging questions, taking into consideration which elements of the Andalusian case study have worked well (or not) in the view of participants and the research team, and why. The purpose is both to reflect on the methods used, and to comment on what has been learned about collaborative processes to bridge the implementation gap between academia and policy action. Eight issues have been identified and each is discussed here in turn, together with a set of comments on each.

#### 3.1. The selection of participants

There was a general consensus between participants and the research team on highlighting the convenience of a custom designed participatory process that matched the stages of backcasting analysis, rather than a traditional expert-guided process across the backcasting process (Banister & Hickman, 2013; Mattila & Antikainen, 2011; Shiftan, Kaplan, & Hakkert, 2003). This means that specific participants are selected at different stages (Wangel, 2011). In the case of the BACK-SCENE project implementation, “visionary participants” were used to draw a normative view of desirable endpoints in the future (visioning phase). “Visionary participants” refer to a wide variety of agents (the public, policy-makers, consultants, academics, etc.) that are able to think ‘outside the box’ about transport futures and to provide legitimacy over the process. Conversely, “instrumental participants” were used during the “policy packaging stage”, and these people included policy-makers and consultants, as participants who can debate policy alternatives and understand how policy options can work together in mutually supporting ways. Finally, policy-makers from different institutions (local, regional, sectorial, etc.) were involved during the “appraisal phase”, given their capacity and experience to anticipate potential consequences of transport scenarios, as well as to assess the scenarios feasibility and acceptability. Most of policy-makers involved in the BACK-SCENE project highlighted positively the selection process and the particular requirements of each of the backcasting stages. Generally, they concurred that “transport issues closer to population daily-life concerns emerged due to the combination of participants profiles made during the project, and this could facilitate a more effective transfer of knowledge from academia to transport policy action”. The group of practitioners was more sceptical in this respect, underlining that “sample size issues could be a limitation for the transferability”, but “recognising the need for a custom designed process”.

The size of the sample is an important issue, as in most cases it is affected by considerations not strictly related to the research themes such as time and cost. For this reason, the crucial determinants are to ensure that the sample reflects both the heterogeneity and the spatial distribution of the participants. The BACK-SCENE project used matrixes that combined expertise, spatial location and socio-economic aspects of participants. Larger samples were used during the “visioning stage” due to the visualisation of desired futures should be a democratic exercise where “all voices” should be heard. However, a smaller number of participants was used for the stages of “policy packaging” and “appraisal”, where knowledgeable people were required, with a high level of practical experience in the field.

Participants also represented the different sub-groups of affected people (e.g. the sub-group of local policy-makers; participants older than 65 years old, etc.) so that population diversity could be addressed. The BACK-SCENE projects participants unanimously agreed that the mix of several generations of participants worked well together, showing a variety of views in all phases of the backcasting process. For example, the most radical transport future visions came from the youngest participants (people between 14 and 35 years old). However, more conventional views came from older participants providing realism on what is achievable. A combination of different levels of experience during the phases of “policy packaging” and “appraisal” was also perceived as positive in Andalusia by both participants and the research team, combining more traditional views (frequently pessimistic on the capacity to reach sustainable outcomes in the region of Andalusia) with more optimistic views (e.g. on the effectiveness of the policy process).

Comment:

- Sample size is important in collaborative studies, but it will vary according to the purpose of the participation, and the different stages in the process;
- All sectors of the population need to be considered so that the societal heterogeneity is reflected, and this means involving those affected by decisions as well as the decision makers themselves.

### 3.2. The combination of participatory techniques

Shifting the paradigm of transport backcasting scenario, from a form of scientific, instrumental rationality to a form of qualitative reasoning based on stakeholders' views, means that there is a need for a combination of multiple and complementary participatory techniques at the three different backcasting stages (Tuominen et al., 2014). However, many previous participatory studies have been limited to a single participatory method to reduce complexity in favour of a more structured process (Hickman et al., 2011; Shiftan et al., 2003; Zimmerman et al., 2012). In the BACK-SCENE project, a wide range of participatory methods have been used including group discussions, questionnaires, Delphi techniques, semi-structured interviews, and ranking methods. A balanced approach that combined top-down and bottom-up participatory processes was specifically implemented in Andalusia, and this was seen by participants as recommendable for bridging the implementation gap. They unanimously agreed that: "the combination of participatory methods makes more reliable the process of policy design, increasing its potential to be transferable".

Top-down methods (e.g. Delphi techniques, questionnaires, multi-criteria analysis, etc.) guarantee a certain level of control by the research team. But, bottom-up methods (e.g. face-to-face meetings; in-depth interviews, etc.) provide a more creative space for participation, where participants can talk through options with each other, and feel more able and confident to participate, and in coming to a consensus. This mix of information sources is key when collaborative scenarios are pursued, combining more guided situations on certain topics of interest with open views and opinions. In the case of the BACK-SCENE project, top-down and bottom-up participatory methods were simultaneously implemented during each backcasting stage (Fig. 1), as well as across the full backcasting process. During the "visioning stage", Delphi techniques were combined with semi-structured interviews, showing how the participants' views involved in semi-structured interviews opened new transport topics that complemented the questionnaire distributed in the Delphi process. On the other hand, face-to-face workshops used during the "policy-packaging stage" were assisted by questionnaires that summarised and nuanced the general agreements achieved between participants. Finally, multi-criteria analysis was used in combination with face-to-face workshops in the "appraisal stage" of backcasting scenarios, identifying and ranking potential impacts generated by those scenarios in the region of Andalusia.

The integration of information from different participatory methods was often seen as a complex process, and this might contribute to bias. While the codification of information in top-down participatory methods is more systematic and easily translated into numbers, information from bottom-up participatory techniques is much more subjective and diverse, and difficult to translate into numbers. In the BACK-SCENE project, several rounds of codifications were carried out to translate the obtained views from bottom-up techniques into information that can be compared with results from top-down methods. Nevertheless, these codification rounds can originate a relevant loss of information. The latter was especially relevant during the "visioning stage".

Comment:

- No single method should be used, as both more directed and less directed approaches are required to generate creative thinking, and real value being obtained from participation;
- The aggregation of quantitative and qualitative information requires careful consideration about the values assigned, and the potential loss of detail. The range of methods available are extensive, but compromise is necessary.

### 3.3. Development of learning processes

A major contribution of the BACK-SCENE project has been the use of transport backcasting scenarios as a tool for promoting learning processes between participants, rather than using the scenarios as a deliberative tool that primarily assists in policy-making. Andalusian backcasting scenarios have not been used as an end in themselves, but as a means by which participants could discuss and confront each other, as well as finding a means to modulate their particular discourses and learn from the perspectives of others. The results produced were collaborative, complex, and mature views of Andalusian transport policy. This differs to the more conventional process of targeting one single participant or group of participants (Ashina et al., 2012; Schade and Schade, 2005; Winyuchakrit et al., 2011).

Collaborative transport scenarios may be weak when learning processes are not activated, as only one set of particular issues are debated rather than a process where the participants' views co-evolve into significant agreements and disagreements. The activation of learning processes requires a scenario building structure that is sequential and iterative, facilitating situations where participants build new knowledge upon insights and views from other participants. For example, during the "policy-packaging stage" in Andalusia, a dynamic participatory process was implemented based on face-to-face dialogue spaces, which evolves from generic and preliminary discussions to specific and focus-group views. This process was iterative and continuous, and it built on the combined knowledge and experiences of the participants. A key element identified when learning processes were implemented was to guarantee a certain level of continuity in the reasoning. This was made during the BACK-SCENE project in both the "policy-packaging and appraisal stages", where a core group of participants (3–6) were common to the different participatory phases, ensuring continuity. This worked well according to most of participants' views, declaring that "the continuity in the reasoning facilitated an easier achievement of agreements and policy design". A crucial point here was to avoid the possibility that the discourse of the core group

has a dominant role in the process. All participants should have an equal opportunity to contribute to the discussion.

The design of the dialogue spaces was also seen as very relevant when learning processes were implemented in the BACK-SCENE project. Face-to-face meetings were used where participants could meet each other in an informal setting, as this makes them more likely to participate. By understanding the views of others, participants moderated their discourses and the opportunities of finding win-win solutions were strongly increased. Another relevant consideration in Andalusia has been the time allocated to discussion. Substantive discussions require considerable time and energy from the participants.

One of the main barriers perceived during the learning processes in the BACK-SCENE project are related to how participants' views were processed and distilled for the rest of participants in subsequent phases. A protocol was carefully designed before starting the participatory process, where objectives for discussion were clearly framed. The results from the discussion also needed to be processed in a meaningful way for the subsequent participatory steps (e.g. using leaflets; multi-media presentations; etc.).

Comment:

- Participatory approaches allow debate and discussion between the different stakeholders, and the development of more holistic understandings of the choices to be made. This complexity reflects the reality;
- The main difficulty was the continuity between the three stages, and the means by which clear narratives can be drawn, overcoming the inconsistencies that can arise over time between participants.

### 3.4. *The need and role of mediators*

The BACK-SCENE project has used an experienced Andalusian transport planner as mediator during face-to-face meetings. Using an independent professional as mediator ensures that the research team only acted as external observers, avoiding interferences between researchers and the participatory dynamics. Both policy-makers and practitioners unanimously agreed that “the incorporation of a mediator was considered satisfactory. Working together, the mediator and the rest of participants produced a stronger feeling of transferability, and this avoided the problems of incorporating academic concerns into the face-to-face meetings”.

Some aspects must be taken into consideration when a mediator is included in the participatory process. First, the mediator background should have a clear transport policy and spatial planning focus, with experience in both public and private sectors, as well as being a “peacemaker” and sensitive to different discourses. Second, the mediator must be supported by certain rules for participation previously discussed with the research team. These rules are important to ensure that the participatory process fulfils minimum requirements, and will be focused on topics of interest for the research. Third, mediator must be clear in issues such as language style, allotting equivalent speaking time to each party, especially ensuring that no participant/group takes a dominant role in discussions. Fourth, mediator should give voice to all participants avoiding situations during the participation where individuals are excluded.

One of the difficulties for the mediator is to determine whether participants with different backgrounds are really prepared to share knowledge with each other. Specific attention should be paid to this possibility, finding a balance between scientific/technical, environmental, sociological, economic, and other terminologies. Converting individual knowledge to collective knowledge requires a particular capacity from the mediator to generate a “common language” between participants. The use of illustrations, practical examples, and best practices from other places facilitated this in the BACK-SCENE project, and it was demonstrated as a useful way to generate common communication frameworks during the phases of “policy packaging” and “appraisal” in Andalusia.

Sometimes, starting a conversation is difficult, but at other times stopping discussions is also hard. Bad choices on how and when to stop discussions can trigger exclusion situations between participants, as well as decreasing the confidence of participants to interact again. In the case of the BACK-SCENE project, the mediator was encouraged to stop discussions when a generalised consensus was reached (> 70% participants agreed). However, the limit was difficult to identify in many situations. Furthermore, the mediator was also encouraged to give continuity to discussions when participants less confident were interacting. This is a matter of judgement and experience for the mediator.

Comment:

- It is important to have high quality, knowledgeable and independent mediation between the participants and between the issues under discussion. The continuity issues raised earlier, and the usefulness of the output depends on the effectiveness, briefing and understanding of this person. He/she is a crucial part of the success of the participatory process;
- The mediator needs to have a perspective on the whole process and a clear understanding of the research objectives. This means there must be continuity throughout, and a mutual trust and understanding between the mediator and the research team.

### 3.5. *Diversity of transport futures and integration of policy pathways*

While scenario building is mainly constructed from the past and present towards the future (forward-looking) as happen in forecasting and exploratory approaches (Börjeson et al., 2006), backcasting scenarios usually look backwards from a single desired future. The main focus is not on likely futures, but on which policy pathways can reach the desirable endpoint. For this reason, in the view of the BACK-SCENE project, multiple futures visions are strongly needed to generate complementary and divergent policy pathways that increase the opportunities to reach sustainable outcomes in the future (Tuominen et al., 2014). Furthermore, multiple future visions would increase the reliability of the outcomes, making them more robust and transferable to practice. This logic was implemented in Andalusia, where three desirable future visions (lower carbon emissions, technological innovation, and urban

compactness) were used to establish policy pathways for implementation.

While the generation of multiple images of transport futures and the associated pathways was seen as an essential point, difficulties occur where there is agreement between participants, as was seen in the case study of Andalusia. During each of the backcasting phases the usefulness of the participatory process was limited when the generation of disruptive transport futures and unusual policy solutions were considered. The way in which “wild cards” are introduced and reacted to by participants during the backcasting process was recognised as one means to overcome the problems that people had not only in thinking about very different transport futures, but also in designing potential measures to reach those futures. These “wild cards” are events that have a very low probability of occurring, but would have a major impact on the outcomes. With respect to sustainable transport, this might include very substantial increases in energy costs or the widespread adoption of a new technology (e.g. electric vehicles). Another approach used was to combine consensus-based views and the more radical outliers that were also proposed to broaden the debate. Those outliers might provide a basis for more radical transport futures visions, as well as more unusual and innovative policy solutions to reach desirable transport endpoints in the longer-term.

Comment:

- One of the main difficulties has been to get participants to think about rather different or novel futures. Methods are needed to address the levels of innovation and speed of change required to reach the 2050 targets and the means to present such futures to participants;
- “Wild cards” or major (but rare) events provide one set of concepts that can be used. Participants should be able to engage with these alternative futures, but they are difficult to communicate to participants, and for many participants to relate to.

### 3.6. Timeline and future horizons

One key element that can affect to make outcomes more transferable and useful for practice is the appropriateness of using timeline and future horizons. Those issues were recurrently discussed with participants during the backcasting process in Andalusia, and many difficulties were found when participants were faced with discussions about their reasoning in the context of the longer-term. However, the backcasting exercise must be contextualised in the longer-term (25–30 years), since its main objective is to implement changes to re-orient existing trends when BAU-projection is no longer appropriate. Furthermore, for bridging the implementation gap between academia and policy action, it is convenient that backcasting exercise can be able to go beyond the planning horizon established by planning figures (in the case of Andalusia, planning horizon used is 10–15 years). This would facilitate a higher capacity to break planning trends and reach new sustainable goals in the longer-term.

The difficulties of participants to deal with long-term futures was most apparent during the “visioning stage”. Participants contextualised their discourses in the mid-term, and they were frequently encouraged to change the future horizon in their interventions. But this proved difficult. Policy-makers and consultants provided the main participants during the “policy packaging and appraisal stages”, and they had less difficulty in projecting their reasoning over the longer-term, as they may be more familiar with the concept of working on different temporal horizons. Nevertheless, participants highlighted the need to establish intermediate temporal milestones during the visualisation of transport visions (“visioning stage”), during the design and implementation of policy pathways (“policy packaging stage”), as well as during the evaluation of potential impacts associated to pathways (“appraisal stage”).

Accordingly, multi-temporal backcasting could be an interesting conceptual innovation to be explored in future research. It relates to the process of creating multiple desirable transport futures in the shorter and mid-term, as intermediate check-points in the pathways towards longer-term futures. The idea of multi-temporal backcasting would be interrelated to designing adaptive policy pathways that can be modified according to the capacity to reach desirable transport futures in the shorter and mid-term (temporal check-points). Nevertheless, the adaptive and flexible frameworks developed in the past have been complicated products, with high risk to become vague and non-transparent. Another way to overcome barriers related to timeline and temporal horizons is to focus on incorporating training activities for participants as part of the participatory process. For example: using narratives on how past technological interruptions have dramatically changed the way in which people experience transport systems.

Comment:

- The timeline is an issue that needs careful consideration as views are clear on the short term (up to 5 years), but less so on the longer term (over 25 years), and the associated questions about when change is needed has proved difficult for participants to engage with;
- One suggestion here is for training activities to be run in association with backcasting, so that learning can take place as part of the process. Care is needed to ensure that no contamination (or bias) enters into the process.

### 3.7. The acceptability of different pathways

The BACK-SCENE project conducted a face-to-face workshop to discuss on feasibility, acceptability and potential implementation barriers to policy pathways. Strong limitations were seen from an economic viewpoint, fundamentally as a consequence of the effects of financial crisis in the south of Spain, and the effects of political corruption associated with the creation of new transport infrastructures. Methodological distinctions were made between financial and political feasibility to facilitate discussion between participants. Political feasibility referred to the possibility that policy measures would be implemented without paying attention to financial issues. It focused on aspects such as the direct or indirect implementation from institutions, ease of communication, social

acceptability, etc. Financial feasibility referred to the possibility that policy implementation would be influenced according to their costs. This distinction strongly facilitated the discussion between participants, avoiding misunderstanding and mixing of information. Lines for future activity are related to the level of synergies and contradictions between divergent pathways, the use of urban-labs to test the social acceptability of some measures, as well as the determination of the level of responsibility of different sectors (public institutions, private companies, citizens, etc.) in implementing such policy options implementation process.

Comment:

- Competences are important, as some participants had high levels of knowledge on financial and political feasibility, whilst others have strong views on social acceptability and responsibilities. All these issues are important for effective implementation and need further work on how these competencies can be shared;
- Contradictions and possible synergies between outcomes make a single pathway difficult to identify. These issues need to be explicitly addressed in future research.

### 3.8. Legal and institutional constraints

The experience from the Andalusia context indicates that participatory processes associated with backcasting scenarios need to be customised for each particular situation, providing “unique experiences”. Factors affecting to the design of the participation process include: time, cost, cultural traditions, level of participatory-oriented education, and other factors. For example, in the context of Spain, people are not used to participating in public decisions, feeling that their opinions are not frequently taken into consideration by policy-makers, consultants and politicians. In this case, a strong effort to provide relevant information was made prior to starting the participatory process. The need to customise collaborative processes for backcasting limits its usability due to the difficulty in providing universal prescriptions. Furthermore, many BACK-SCENÉs participants noticed the added value of collaborative scenarios, but recognised that those scenarios are not likely to be usable in Andalusia in the near future. Legal barriers and the low commitment of Andalusian politicians to participatory processes are seen as obstacles to overcome in real practice. In this context, the BACK-SCENE project should be seen as an initial point of innovation that still needs to be refined. The use of controlled experiments and/or simulations close-to-real-practice could facilitate a process to distil current findings triggering more generally applicable solutions (Straatemeier, Bertolini, te Brömmelstroet, & Hoetjes, 2010).

Comment:

- The diversity of responses and issues raised at all stages in the backcasting process illustrate the strength of feeling and political nature of the options being considered. This is both a strength and weakness, as it reflects the complexity of the problems being considered and the difficulties of coming to a resolution through a consensus seeking process;
- Collaborative processes should be seen as a continuous process that extends over time and space, but they should also address the legal and institutional barriers that impede effective implementation. This might provide the best way to bridge the implementation gap.

## 4. Conclusions

Significant changes are taking place in transport policy, resulting in the emergence of new approaches, including those that involve greater levels of participation. This means that a wide range of actors and professional domains – sooner rather than later – should engage in different ways with issues of sustainable transport and climate policy. However, certain ways of thinking prevail, impeding an effective involvement of stakeholders in favour of more structured processes. This paper has provided some commentary, reflections and discussions on collaborative backcasting scenarios in transport, as an instrument for climate change mitigation, where the gap between academic research and real practice must be bridged. Some of the main results obtained during the BACK-SCENE project have been described and summarised, together with a set of issues that reflect on the strengths and weaknesses of collaborative backcasting. In the view of the participants and the research team the overall conclusions are positive, as indicated by these four concluding points:

1. *Collaborative backcasting provides a learning framework:* The aim of the present paper is not to give a complete list of research challenges to be addressed in the field of transport backcasting under collaborative schemes, but it has focused on describing interesting lessons learned in the Andalusian experience (Spain) that might form part of any follow-up study. It has specifically covered some of the situations where participatory aspects in Andalusia worked well (or not) for bridging the implementation gap, providing more generic set of discussions for going forward. Although Andalusia has been used as the specific case study, the overall objective has been to think more about the “universal prescriptions”, and the clear messages that would help in the (re) orientation of future backcasting transport studies. Both instrumental and process-related considerations have been demonstrated in this paper. Firstly, instrumental-related considerations refer to conceptual improvements to reframe backcasting scenarios as a central element in determining policy options and packages for climate change mitigation. Instrumental innovations would include the development of “multi-temporal” backcasting, the role of “wild cards”, and the need to create divergent policy pathways to reach sustainable transport outcomes. Secondly, process-related innovations would focus on the methodological aspects of how stakeholders can be engaged in a more effective way. Examples would include the refinement of learning processes, the issue of sample-size, and the combination of “top-down” and “bottom-up” participatory methods.

2. *Collaborative backcasting explicitly includes the interrelationships between topics*: The above discussions are not only relevant for future backcasting research as stand-alone topics, but there are also combinations that can provide interesting research avenues. Examples of this can be the development of a multi-temporal backcasting methodology combined with the exploration of legal constraints to facilitate its practical implementation, the connection between the creation of multiple desirable transport futures and the social acceptability of pathways for implementation, as well as the combination of several participatory methods with the development of disruptive and divergent transport policy pathways.
3. *Collaborative backcasting has academic gains*: A key objective of this paper has been the bridging of the implementation gap between academic insights on backcasting and real transport practice. A more active role has been assigned to stakeholders as part of the BACK-SCENE project, and promising outcomes have been achieved. Some of these positives have been highlighted, such as the dynamic learning process, the breaking down of barriers between stakeholders, and the innovative policy opportunities. In addition the potential for practitioners being subjected to more academic ways of thinking means that their discourses can be better structured and become more consistent. This in turn means that acceptability and action are both more likely. A key challenge here is to determine whether participants with different backgrounds are really prepared to share knowledge and experiences with each other. The transformation of “individual knowledge” into “collective knowledge” necessitates the use of systematic processes of codification. This may be problematical, and certain procedural rules might be needed. The mediator provides one means to translate the individual discourses into a “common language” so that all participants fully understand the discussions, but most of them may be rooted in the professional experience (and language) of individual participants. If this barrier is not overcome, the backcasting process may become biased or subverted, with certain forms of knowledge being privileged over others.
4. *Collaborative backcasting has social benefits*: The richness of the discussions outlined in this paper has been essentially ignored in much of the previous research that is mainly technical in its focus. Research discussions currently being carried out are directed at the means by which climate change can be faced, as well as moving towards more liveable cities, including ways for overcoming transport-related social exclusion. These are often limited in scope, as they tend to be technical in nature, looking primarily at issues in isolation rather than as part of the wider societal view of sustainable transport futures. This study has found that a wide range of participants have clear views on these topics, and they are very concerned about being part of the debate over their own future, and the means by which they are going to be moving around in the future. Their inclusion may be a crucial element in the acceptability of different future options, and reconciliation between what the experts expect to happen and what actually does happen. Their involvement in the process will make a real difference.

The present research has presented a transport policy-making process based on a collaborative approach that helps to understand, analyse and respond to the existing gaps between normative futures identified through scenario building and real transport practice. It is concluded that the implementation gap can be bridged in a positive and creative way that has the understanding and support of stakeholders, and real progress can be made towards sustainable transport. But, equally important is that through participatory processes outcomes are more likely to match expectations.

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